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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/706,963

11/14/2003

Vassoudevane Lebonheur

P-6119-US

7768

27130

7590

10/20/2005

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EXAMINER

QUACH, TUAN N

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 10/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/706,963

Applicant(s)

LEBONHEUR ET AL.

Examiner

Tuan Quach

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 30-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Newly submitted claims 30-32 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: these claims correspond to process claims in class 438, subclass 108 whereas original claims 1-29 correspond to product claims class 257 subclass 734, and wherein patentability of the process claims does not require patentability of the product claims and vice versa, since the product claims, e.g., as in claim 1, do not require inserting a filler material as in claim 30 lines 6-7.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 30-32 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

This claim appears to contradict claim 1 since it encompasses 400°C and does not further limit claim 1.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1, 2, 4-9, 11-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunoi et al. taken with Tsukahara and Dias.

Regarding claims, 1, 2, 4-7, 9, 11-13, 19-26 Tsunoi et al. 6,482,676 teaches a device including first electrical unit 3, a second electrical unit 1, first set of electrical connections extending from second electrical unit 1, each of the first set of the first set of electrical connections including a distal tip and a base, wherein at least a distal portion of the first set of electrical connections narrows toward the distal tip, including a linear fashion, e.g., Fig. 1A, to the extent such can be determined and sufficiently characterized, e.g., Figs. 1A, 2. See column 3 line 19 to column 5 line 60; column 6 line 15 to column 8 line 22. Tsunoi et al. lacks primarily the recitation of the first set of electrical connections including material of melting point of above 400° C (previously at least 50% copper).

Tsukaha 6,051,093 also teaches a device including substrate 4 including electrical connections 7, semiconductor die 1, including set of electrical connections 15

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having first end connection are and second end connection are, the first end connection are being connected to the semiconductor die, being wider than the second end (corresponding to a distal tip and a base, wherein at least a distal portion of the first set of electrical connections narrows toward the distal tip). Note that the "linear fashion" is as shown in the figures, e.g., Fig. 6, 8(a)-10, 14-15(a), at least in a selected distal portion thereof, and alternatively, such linear fashion to the extent can be determined and sufficiently characterized would have been obvious and does not require any inventiveness. See Figs. 6-10, 14-16, column 6 line 38 to column 7 line 60, column 9 line 40 to column 9 line 40.

Regarding claim 14, 17, 18, Tsunoi et al. 6,482,676 teaches a device including substrate 3 including electrical connections 4, semiconductor die 1, including set of electrical connections 6 having first end connection are and second end connection are, the first end connection are being connected to the semiconductor die, being wider than the second end (corresponding to a distal tip and a base, wherein at least a distal portion of the first set of electrical connections narrows toward the distal tip), including the "linear fashion" as shown in the figures and alternatively, such linear fashion would be at least in a predetermined distal portion thereof as shown, eg., Fig. 1A, 2 and in any event would obvious and does not require any inventiveness. See column 3 line 19 to column 5 line 60; column 6 line 15 to column 8 line 22. Regarding claim 18, the resin is shown in Fig. 1F, material 9. Regarding claims 16, 17, the substantial conical is also shown in Fig. 1A-1F.

Tsukaha 6,051,093 also teaches a device including substrate 4 including electrical connections 7, semiconductor die 1, including set of electrical connections 15 having first end connection are and second end connection are, the first end connection are being connected to the semiconductor die, being wider than the second end (corresponding to a distal tip and a base, wherein at least a distal portion of the first set of electrical connections narrows toward the distal tip).. See Figs. 6-10, 14-16, column 6 line 38 to column 7 line 60, column 9 line 40 to column 9 line 40. Regarding claim 18, the non-conductive material is shown in Fig. 14(d), material 21. Regarding the shape claimed, Tsukaha further show the desired shape for the bump including the substantial triangular, Figs. 6, 8a, 14(a), 15(a) of Tsukahara, element 15, and such selection of such conventional shape would have been apparent or otherwise conventional and obvious. Note that the "linear fashion" is as shown in the figures, e.g., Fig. 6, 8(a)-10, 14-15(a), at least in a selected distal portion thereof, and alternatively, such linear fashion to the extent can be determined and sufficiently characterized would have been obvious and does not require any inventiveness.

The references lack primarily the recitation of the melting point above 400 ° C (previously corresponding to material including at least 50% copper material).

Dias teach the bump materials can be any suitable conductive materials including those have melting above 400° C, including copper, gold, etc. See column 2 lines 30-38.

It would have been obvious to one skilled in the art in practicing Tsunoi et al. or Tsukahara to have employed the conductive materials such as copper, gold, etc., and

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thereby encompassing the associated melting points of above 400° C since such use of such materials is conventional and advantageous as taught by Dias and since such would correspond to and encompass the associated melting point as claimed. It would have been obvious and would have been within the purview of one skilled in the art to have selected the suitable copper content including at least 50% as in claim 1 and 15, or at least 80% as in claim 4. Regarding claim 5, the suitable melting point would follow the suitable copper alloy employed. The appropriate shapes in claims 6, 9 and 11 would have been obvious and apparent as shown in Fig. 1-3, particularly Fig. 1B, 2 in Tsunoi et al. and as shown in Figs. 6, 8a, 14(a), 15(a) of Tsukahara, element 15. Regarding claims 12 the inclusion of the nonconductive material resin is well known as shown in Fig. 1F, material 9, in Tsunoi et al. Regarding claims 8, 22, 23, in addition to the shapes shown in Tsunoi et al. above, Tsukahara further show the desired shape for the bump including the substantial triangular, Fig. 6, 814b, 9B, and such selection of such conventional shape would have been conventional and obvious.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunoi et al. taken with Tsukahara and Dias as applied to claims 1, 2, 4-9, 11-26 above, and further in view of Hsieh et al.

Regarding the alternative of the first electric al unit is a semiconductor chip, Hsieh shows the formation of bumps 210 joined into pads 306 on chip 300. See column 3 line 1 to column 4 line 25.

It would have been obvious to have employed the first unit as a semiconductor die since such is conventional as evidenced by Hsieh et al. wherein flip chip bonding can be effected by forming metal bumps on flip-chip substrate using simpler processing.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunoi et al. taken with Tsukahara and Dias as applied to claims 1, 2, 4-9, 11-26 above, and further in view of Shiota et al. or Liu et al.

The references as applied above do not recite pentagon shape. Shiota et al. recite the pentagon shape, column 9 lines 25-40, wherein the reliability of electrical connection can be obtained. Liu et al. 2002/0109227 A1 also evidences the conventional of pentagon bumps. See [0031], claim 9.

It would have been obvious to one skilled in the art in practicing the above invention to have employed such conventional shape is conventional and advantageous to improve reliability as evidenced by Shiota et al. or Liu et al.

Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunoi et al. taken with Tsukahara and further in view of Dias and Hua.

Tsunoi et al., Tsukahara and Dias are applied as above and do not recite the processor and the DRAM in claim 27.

Hua, 2004/0262778, teaches the application into processor 500 and DRAMs. See [0042], Figs. 1-5, [0012]-[0030], [0039-0044]. wherein the provision of bumps 130 on chip 110 joined to joint 140 and pad 150 on substrate 160 is also shown.

It would have been obvious to one skilled in the art to have applied the above structures into processor and DRAMs device since such application is conventional and

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obvious for forming such devices employing the connections in question as evidenced by Hua.

Applicant's arguments with respect to claims 1-29 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Tuan Quach whose telephone number is 571-272-1717. The examiner can normally be reached on M-F from 8:30 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Nathan Flynn, can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tuan Quach
Primary Examiner